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THE CHANGING FARMING ENVIRONMENT IN TANZANIA: THE CASE OF SELECTED VILLAGES IN KILIMANJARO*

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ABSTRACT This study examines the changing farming environment among the smallholder farmers in Tanzania under the ongoing world-wide economic reform measures. Various economic reform measures being implemented have far-reaching effects on farming behaviour.

Small farmers have increasingly done away with the production of the traditional export crops and instead have shifted to the product of quick-selling crops such as vegetables and paddy. It was observed that most farmers are facing serious economic hardships. To cope with this difficult situation, they have turned to the use of easily avairable supply of manure, seeds and chemicals. There is also environmental degradation due to land-clearing for fuel, farming and building materials.

Liberalization of agricultural marketing has also had serious repercussions. Farmers are unable to obtain credit for farm inputs. This is partly due to the marketing cooperatives' failure to compete with other buyers. Already cooperatives have lost market share for food crops to private traders/dealers.

Farmers specializing in paddy production under controlled irrigation practices have better prospect than others. Their income has increased. This situation has attracted civil servants to go back for farming.

Key Words: Structural adjustment; Farming environment; Small farmers; Liberalization; Kilimanjaro; Tanzania.

STUDY DESIGNING

I. Research Background

The introduction of Structural Adjustment Programmes (SAP) has brought about a new farming environment among the small farmers in the developing countries. In many of these countries, before liberalization, governments intervened through various mechanisms in the farming activities. In Tanzania, for instance, the government

* This study was conducted in four villages of the northern Tanzania during the month of August 1996 with the support from the Cooperative College-Moshi and the College of International Studies of Chubu University, Japan.

used marketing, price, and technology policies to regulate agricultural production and marketing. The government predetermined prices of agricultural inputs and outputs, and marketing of agricultural produce were carried through a state-controlled single marketing channel. On the other hand, agricultural production was not handled by the state-owned institutions.

Since the adoption of the SAP in 1986, several reforms have been introduced with the support of the International Monetary Fund (IMF) and the World Bank, which have had a significant bearing on the smallholder farming practices in rural Tanzania. This study examines these changes. The objective of the study is to assess the effect of the changing farming environment among the smallholder farmers in the developing countries by drawing cases from four villages in the Kilimanjaro Region of the northern Tanzania. For the purpose of this study the term, "farming environment," will refer to all those factors that shape the farming behaviour and decisions in farm resource allocation such as the producer prices, input prices, marketing channels, labour availability and also the availability of other supporting services such as transportation, credit and extension services.

II. Research Methodology

In this study various methods were used in data collection. They include structured interviews using questionnaires, village visits for observations, informal discussions, and review of records.

A team of researchers visited four villages in Moshi, Mwanga and Same districts in Kilimanjaro Region. During the field visits, twenty-five farmers were interviewed and their farming practices observed. The villages and the number of interviewed farmers were as follows: Sisa Maro (Moshi), 5 farmers; Shiri-Mgungani (Moshi), 6 farmers; Ndorwe (Mwanga), 5 farmers; and Ndungu (Same), 9 farmers. The selection of the villages was based on the need for the data coverage to include both mountain villages (Sisa Maro and Ndorwe) and lowland villages (Shiri-Mgungani and Ndungu). Farmers were selected randomly in each village to satisfy the sample size predetermined per village. However, gender consideration was employed in some.

In all of the four villagers, irrigation forms an important part of the farming culture. With the exceptation of Ndungu which has a modern type of irrigation, other villages utilize traditional irrigation systems. While Ndungu is a predominantly paddy-growing area, other areas practice mixed cropping that include coffee, maize, paddy, bananas, sugar cane, beans, and vegetables.

Our main concern of the study is to examine whether the current changing farming environment has a favourable effect to smallholder farmers in Tanzania, and, if so, in what way.

III. Agricultural Market Deregulation and Price De-controls

In 1986, the government of Tanzania made a major U-turn in its domestic stateed economic policies by introducing the first comprehensive Economic Recovery Programme (ERP) that was prepared in collaboration with the World Bank. The ERP

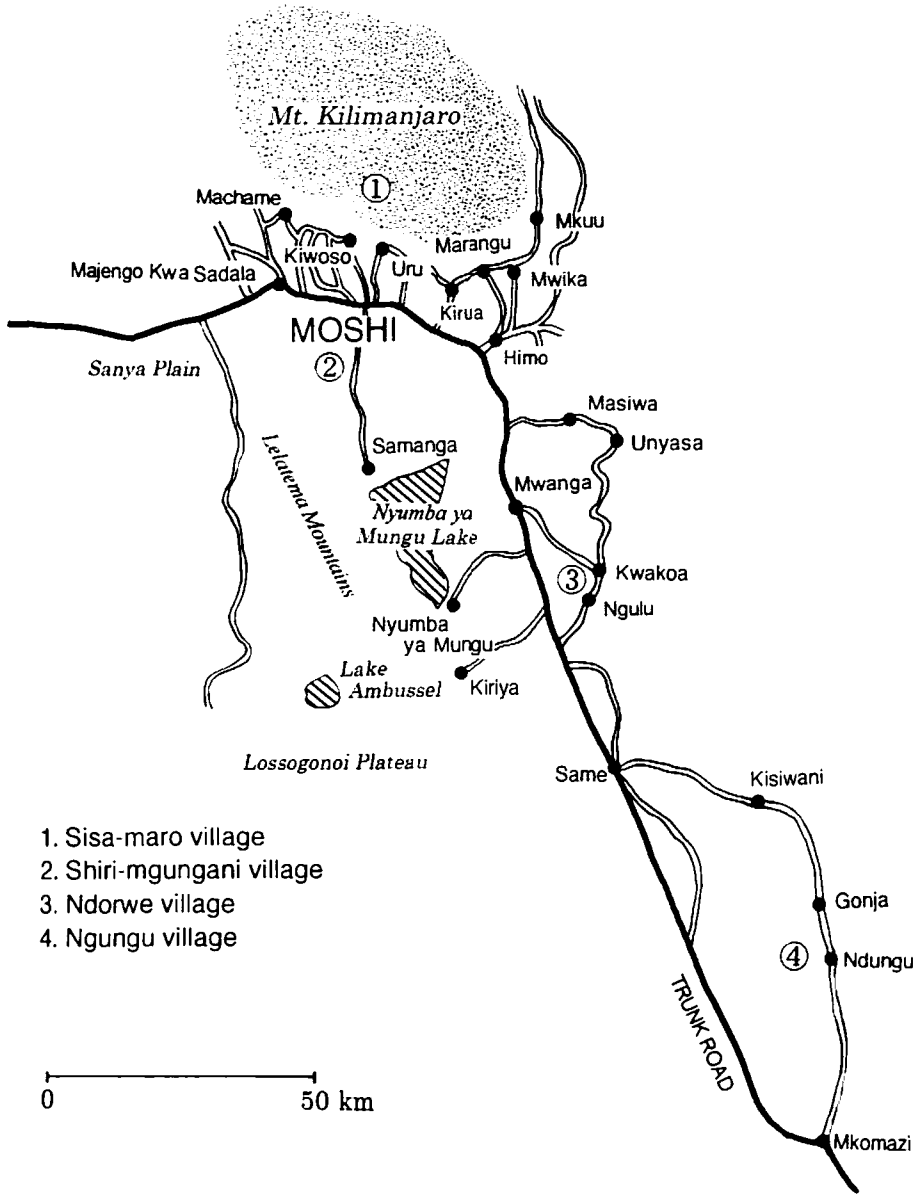

Fig. 1. Location of the Surveyed villages

introduced serious measures to deregulate the domestic market. The major policy measures introduced included increased agricultural producer prices, foreign exchange rates adjustment, removal of price controls on certain crops and products, abandonment of trade barriers, and introduction of various institutional reforms (URT, 1986: 14-16). Consequently, consumer prices were decontrolled and the mar-

keting of the less-preferred staples (cassava, millet and sorghum), oilseeds (groundnuts, sunflower and sesame), soybeans and pulses, and copra were deregulated. Cooperatives were given the responsibility of intra-regional food distribution and were subsequently allowed to deal directly with private traders. The role of the National Milling Cooperation (NMC), the sole food trading parastatal, was reduced to that of operating strategic grain reserves, grain milling, food imports, and managing food aid. Up to this year, the total government control of agricultural marketing was justified in the name of food security and equity (Ellis, 1992; Bryceson, 1993), but it proved ineffective as it created parallel markets for various products (Maliyamkono & Bagachwa, 1990; Bee, 1996). The control of food crops did not benefit the targeted groups: the poor and salaried people (Amani, 1992). Agricultural prices were fully decontrolled in 1991/92 crop season for food crops and in the following year for export crops. However, the government introduced indicator pricing system which served as a guide to producers in negotiating prices with buyers.

Input supply was also liberalized. Private dealers were allowed to market and distribute agro-chemicals, fertilizers, seeds, and agricultural equipment and machinery. Likewise, the marketing of both export and food crops were liberalized by stages until 1995, when coffee, the only remaining crop, was completely decontrolled.

The financial sector was also liberalized when the government enacted a series of legislations dealing with the financial institution and banking. These allowed the establishment and registration of private financial institutions of banks and bureau de change. With the establishment of new private banks, existing public financial institutions formulated stringent financial measures that created difficult conditions in obtaining loans.

FINDINGS AND RESULTS

I. Production Practices

Agriculture in Tanzania forms the basis of livelihood among the majority of the rural families. Before the 1970s, people grew many crops where each farmer tried to grow a variety of crops in small amounts mainly due to market limitations. Modern input use was also limited due to availability problems, and household self-sufficiency in the type and amount of crops was the main motive for farming. Local production practices were predominant and regulation for land tenure and land use was limited.

During the 1970s and early 1980s, structure started to change mainly through government initiatives which took the form of provision of extension services on modern farming techniques and use of inputs such as fertilizers, improved seeds, pesticides and herbicides, and mechanization. Cooperatives were the main channels through which these inputs reached the farmers. Due to costs involved and importance of the agricultural sector to the nation, most of the inputs were subsidized by the government and cooperatives benefited by distributing these inputs through.

With the introduction of SAPs, subsidies have been removed and input trade lib-

eralized. As a result of these measures, there has been a rapid increase of input prices. It was observed from the surveyed group of farmers that many of them have now abandoned the use of chemical fertilizers, tractors, oxen ploughs, high-yield variety seeds and pesticides. About 87% of the surveyed farmers have used manure for the last three crop seasons. Manure is either made on the farm (particularly if farmers kept animals) or bought from other farmers. For the highland farmers of Shisa Maro, home-made manure is always in short supply. Thus they have to buy from distant lowland areas. A seven-ton lorry load costs about Tshs. 5,000 which is just enough for a hectre for one season.

Almost all farmers in the surveyed areas used home-prepared seeds/seedlings for maize, paddy, beans, and vegetables. However, in some places, maize seeds were bought by farmers every season. This was the case for farmers in Sisa Maro, Shiri-Mgungani, and Ndungu villages.

The use of Agro-chemicals was also very low especially among the coffee-growing households in Sisa Maro and Ndorwe villages. This was due to excessive prices unaffordable by small farmers. The prices have increased sharply while cooperatives have been weakened financially and were unable to provide farmers with agro-chemicals on credit. The coffee crop which requires a lot of chemical sprays has as a result been affected as farmers fail to purchase and apply them. About 79% of the farmers in Ndorwe and Sisa Maro have reported that their coffee output has decreased especially in the 1990s.

The failure to purchase modern inputs has, however, initiated a sense of creativity among small-holder farmers. In Ndorwe village, for instance, farmers are now preparing locally made insecticides from herbs and ashes known as *ngonye* (in Pare language) for use in coffee spraying in place of industrial insecticides. In Ndungu, farmers prefer to buy fertilizers in small units of measure (in kiliogrammes) rather than in 50 kg. bags as was the case in the past. The use of agro-chemicals in the predominantly paddy-growing villages such as Ndungu is still seen. However, their application is limited. Farmers are now using hire services in chemical application equipment such as sprayers instead of buying and owning them. This practice is becoming more and more popular economic choice for farmers. For example, instead of buying a litre for Tshs. 10,000/=, a farmer will hire a sprayer-man who will charge only half of the cost for three sprays per season for each plot of 0.3 ha.

In a world which is moving towards environment-friendly agriculture, the direction of Kilimanjaro farmers seem to be commendable. Farmers will not only reduce the nation's expenditure on imports but facilitate low external inputs. It seems that SAPs are playing regulatory functions in areas where the use of imported inputs was previously high. The need for higher farm capital investments is contained as the use of local insecticides and use of hired chemical application services do not call for someone to invest deeply in equipment.

This move, however, is not without a cost. The main opportunity cost of using the above alternatives is the loss in output since the local inputs are not as efficient as the modern ones. Output per unit area, for most crops grown, is relatively low when, for example, manure alone is applied in a maize or paddy plot as compared to when industrial fertilizers are applied with or without the use of manure. While an acre of maize produced 7 to 10 bags (90 kgs.) of maize in Shiri-Mgungani without fertilizer,

the application of fertilizers increased yield to more than 20 bags in 1994/95.

Low output per acre was also reported in other villages for maize and coffee. Low coffee output is mainly due to inadequate application of insecticides rather than the inadequate use of fertilizers. The main problem of manure is that the methods of preparation and storage are not appropriate in conserving the nutrients. Most of the manure is kept in areas exposed to direct sunlight and rain while the floors are also not cemented. This leads to a substantial loss of nutrients through evaporation (mainly ammonia) and leaching. So qualitatively the efficacy is low.

II. Mechanization of Production

Agricultural mechanization in the surveyed villages is generally limited as observed during the survey period except for Ndungu village. Farmers mainly use the hand hoe for land cultivation and weeding. However, in Ndungu and Shiri-Mgungani villages tractor cultivation is common. For the Ndungu village, this is because paddy production is under a government-initiated irrigation project with the help of the government of Japan through grant aids where all the farm operations are done as recommended by the project management. The project has 27 tractors (for 680 ha.) which villagers use at a fee. These tractors were purchased by the project in order to ensure that all the farm operations under the project are carried out timely. Of late, unexpected mechanization has entered paddy harvesting in Ndungu village, as a combine harvester started to come there for hire service. In other villages there is little mechanization mainly because the hilly, mountanious areas do not allow tractors to be used. Here hired labour is used when necessary but its availability is a problem. When available, it is mainly provided by children as observed in Shiri-Mgungani village. Cheapness of such labour is the main attraction of those responsible for use. Since exploitation of child labour is forbidden, it is high time that farmers in this area get educated about this.

Mechanization in production can be useful for farmers in the respective areas because they have eased significantly the labour costs. For example, introduction of paddy harvesters has reduced labour costs by about 40% from Tshs. 38,000 for a 0.3 ha. plot to only Tshs. 23,000, if we assume that all the harvesting works were hired out previously. Farmers are also enjoying less drudgery now than before, and this could be seen as an improvement in the farmers working conditions. However, this is against the idea of promoting labour-intensive agriculture for poverty alleviation as advocated by the government. The imported combine harvester has a very high foreign exchange content and the spare parts are not available locally in case of break down. Since this is an area where productivity of land is relatively high under controlled production practices, the combine harvesters is viable only if the hire charge is easily met by the farmers while the owner of the combine harvester has calculated the full operation costs including its depreciation for a long term sustainability.

III. Agricultural Marketing

Another important element worth discussing is that there is a growing trade in the

rural areas as farmers try to sell their produce for cash to meet social and economic demands. This trade is, however, limited because of inadequate information about potential markets, the market prices and even the marketing costs.

Farmers in all the villages surveyed have said that they have received low produce prices simply because they did not know the going price in the main markets or were unaware of the best potential markets for their products. Distant villages from the main markets, such as Sisa Maro, are the most disadvantaged. For example, while a head of cabbage fetched between Tshs. 25 and Tshs. 50 at Sisa Maro village, in Moshi Municipality (30 Km away) the same cabbage fetched between Tshs. 100 and Tshs. 300 which is enough to cover transport costs and the necessary taxes, leaving a substantial profit margin for the wholesaler and the retailer.

In the paddy growing area of Ndungu, the farmers are much more knowledgeable about their market competitors, when competition is stiff or when prices are high and which prices are offered in the main markets, because they produce relatively large-scale. The problem with these farmers is, however, that they have not managed to make use of this knowledge as a stronger bargaining power for their produce. This is because they acknowledge that the competitive produce (local paddy varieties) are of better teste than their high-yielding IR-54 variety, and allow the traders to reduce the prices.

Such factors create uncertainty about future prices and hence farmers find it risky to withhold their output for the off-season period when prices are reasonably higher. Due to this, fluctuations of product prices of up to 100% has been observed within a season. For example, paddy would sell at Tshs. 5,000 during the harvest season but three to five months later prices go as high as Tshs. 10,000 per bag. Farmers can control this only if they form strong farmer institutions with a strong financial base and bargaining power, which will enable them to secure distant markets and make supply contracts with buyers.

Crop marketing used to be mainly a cooperative activity in Tanzania up to 1991/92 when almost all the crops for food and export were decontrolled. Then the private non-cooperative buyers came in to buy the crop and trade. The producer prices were allowed to be set by market forces rather than by the government as part of the policy in the country.

Generally speaking, the entry of private buyers in crop marketing has had a positive effect to farmers because 95% of the farmers have expressed satisfaction with the availability of alternative markets for their crops. Food crops are mainly handled by private buyers while cash crops, mainly coffee, are handled by cooperatives. Cooperatives are not as efficient as they sometimes were in the past. This is mainly because they have no ready finance for purchasing the crops with cash from the farmers. Financially weak cooperatives had to lower the producer prices offered to farmers. For example, cooperatives in Same and Mwanga districts were observed to have reduced the producer price for coffee from Tshs. 1,200 per kg. during the 1994/95 crop season to only Tshs. 400 in 1995/96 (a 76% decrease). In Moshi district, the producer price has been reduced by 58% from Tshs. 1,200 per kg. to Tshs. 500 per kg. Private buyers such as Dorman and Co. have settled at Tshs. 700 per kg. and they tend to reduce the price as cooperatives lower theirs.

Despite this reduction, each payment by cooperatives is not effected. This has

made it necessary for farmers to sell most of their coffee crop to licensed private non-cooperative buyers. The future of cooperatives seems to be shaky as they continue to lose member loyalty and business volume. The Kilimanjaro Native Cooperative Union (KNCU) with a long history of cooperative activities since 1932, has already lost almost 30% of its coffee market share by June, 1996, while both KNCU and the Vuasu Cooperative Union (VUASU), a cooperative union of the Pare people, lost 100% of the food crop market share, as they withdrew from trading in these crops.

Crop marketing is also problem for the vegetable growers in the areas like Sisa Maro and Shiri-Mgungani because the crops are highly perishable. The perishability of these crops make it difficult for farmers to withhold their products when buyers offer lower prices. Farmers themselves are unable to transport their crops to the main markets because of inadequate market information on marketing costs particularly transport costs, the best markets and market prices. Therefore the returns obtained are not always worth the efforts made. Despite this weakness, all the farmers interviewed are involved in vegetable production. Farmers' associations may be a way out of this problem through the purchase of light vehicles such as pick-ups for the transport of their vegetables to nearby urban markets or gathering market informations and advising the members accordingly.

IV. Returns from Farming

The cash crop farming activity in the surveyed areas seems to be less important now as compared to food crops and horticulture. Coffee, the main cash crop, is becoming less attractive mainly because of high production costs in chemicals and harvesting. For example, the cost of litre of coffee insecticide was Tshs. 5,000 in 1994/95, by August. In 1996, its cost was Tshs. 15,000 while the producer price actually went down. This has decreased the returns from cash crop production after the government liberalized the market as well as removed subsidies.

For crops such as paddy, returns are reasonably high, averaging at a minimum gross margin of Tshs. 386,000 per ha. (see Appendix 1). This is for the farmers with the improved irrigation project in Ndungu area. Farmers operating out of the project area also have a reasonably high gross margin of about Tshs. 301,000 per ha. (see Appendix 2) mainly because they follow the production methods and calendar practiced by the project, although they use local seeds.

We have carried out these gross margin analyses based on the notion of the average farmer under the assumptions listed in the notes of the appendices. This gross margin can be increased even by half should the farmers decide to spend more household labour in farming or growing twice per season each year under irrigation. This is far beyond the current government minimum wage of Tshs. 360,000 per annum. High return in the agricultural sector has already started to attract entrant farmers as observed during the survey. Out of the total interviewed farmers, 39% were previously employed in government departments and parastatals as teachers, clerks, or security men, who later left the sector in favour of agricultural employment.

Food self-sufficiency has not been achieved in Sisa Maro and Shiri-Mgungani vil-

lages. it has been observed that about 68% of the farmers do purchase maize from the market to supplement their home-grown food supply. Maize is one of the major staple crops in the surveyed areas just like bananas. Inter-village and inter-district trade is the main facilitator of main crop movement from surplus to deficit areas.

ENVIRONMENTAL ISSUES

The concern for environmental conservation is growing worldwide. Excessive use of fertilizers and other agro-chemicals (insecticides and fungicides) are among the main potential causes of pollution, especially water pollution, while deforestation and uncontrolled cultivation of mountain slopes may result in soil erosion. It is feared that the changing farming environment encourages farmers to cause pollution and deforestation. In the surveyed villages, agricultural production seem to have little environmental impact through the use of agro-chemicals. This is because of the observed declining trend in the use of agro-chemicals as farmers fail to purchase these inputs on account of excessive prices. The observed shift to organic fertilizers in plausible.

For Ndungu village, environmental problems need long term commitment. This is because the area has always been a cleared dry lowland with limited tree cover. There are trees on the neighbouring hills, as well as lowland far away from the village. As the farmers depend on these trees for their supply of building materials and fuelwood, the soil cover there may decline rapidly. Efforts for reforestation of the area have not been initiated. The neighbouring hills are also a source for both irrigation and household water. This means that continued removal of the soil cover may significantly reduce the volume of irrigation water and water use efficiency by silting.

Already, water is not enough to irrigate all the project area during the dry season and only one third of the area is irrigated. In order to alleviate land degradation that may reduce paddy production in future, deliberate efforts are needed to start tree planting operations, and to sensitize farmers on alternative sources of fuel, e.g. electricity, or introduce cookers which use paddy husks as fuel. This is a long term problem not perhaps directly related to the recent structural adjustment policies.

For Ndorwe village, the problem is different. Farmers in the village depend their domestic water supply and irrigation on the same highland sources where they also farm. The potential and observed problems in this village is that farmers cultivate near the water sources on the hill sides and construct irrigation canals right from the upland water sources. This reduces the watershed cover which may result in soil erosion and pollution of the water meant for domestic use. Already measures to control these have started through terracing and tree planting, but terracing is at a very low pace because it is a highly labour-consuming activity.

Tree planting is also necessary for the lowland Shiri-Mgungani village. The same is not necessary urgent for the upland Sisa Maro village with a permanent soil cover of perennial crops, mainly bananas, coffee trees and shade trees. Farmers in this area also believe that chemical fertilizers are not good for their soils and therefore use little of them while manure application is more common. However, since their main

source of power is fuelwood, tree planting need to be part of their farming system.

Promotion of agro-forestry is a necessity in these villages. Farmers need to be advised on how to establish live fences of hedge rows or shade trees. These will improve environmental outlook, act as wind breaks and provide food if fruit trees will be incorporated. The Ndungu farmers could be advised to go back to their coconut plantations which they have deserted with no reason.

SUMMARY AND CONCLUSION

The government of Tanzania has since the mid-1980s engaged in a continuous structural adjustment. As a result, marketing of agricultural crops and distribution of inputs have been liberalized. Producer prices, bank interest rates exchange rates have been decontrolled.

The introduction of SAPs has brought about a new farming environment among the smallholder farmers in the rural Tanzania. The removal of subsidies on inputs and devaluation of the shilling have impaired farmer ability to acquire and use agro-chemicals, fertilizers, improved seeds, equipment and machinery for improved production. Interestingly, most farmers have now gone into the production of quick-selling crops such as vegetables and paddy foregoing their previous perennial cash crops such as coffee. Others have established petty trading activities to supplement their falling incomes from agriculture. Since prices of imported agricultural inputs are unaffordable by many smallholder farmers, they tend to return to the use of their own seeds rather than purchased seeds, and sometimes devise locally-made insecticides.

When interviewed on how farmers find life in general since the government introduced a series of reform measures, the majority of the sampled farmers indicated that life was quite tough. In order to cope, farmers have adopted several counter-measures in all the villages visited. Irrigation, for instance, is being strengthened in all the villages visited: Sisa Maro, Shiri-Mgungani, Ndorwe and Ndungu. It helps small producers grow twice or sometimes three times in a year, during both the dry and wet seasons. The practice at least assures farmers of steadier crop harvest when other factors remain constant. While in some places such as Ndungu, farmers specialize in production of a single crop (paddy), in others farmers practice mixed farming such as kitchen gardening, paddy, bananas, coffee, maize, and sugar cane.

Assessing what villagers have achieved from farming, some success could however be noted. In Ndungu wealthier farmers are able to rent extra plots and hire labour and other services. With increased incomes from farming, they are able to build modern houses and acquire durable properties such as radio-cassettes and even televisions and video cassettes. In contrast, their counter-parts in the land-constrained mountainous areas like Ndorwe, farmers are engaged in sideline activities such as petty business to supplement their incomes and others rent out their plots. They are realizing that these sideline activities pay more than farming.

To cope with economic hardships, slowly more farmers are joining voluntary farmers' associations. In all the villages visited, there were farmers' associations. These are agricultural marketing cooperative societies, water-users groups, partici-

patory income generating groups, and community works such as the *mutharagambo* (msaragambo) in Ndorwe village. The rational for such group is to pull together resources and wisdom in order to attain the economies of scale in farming and marketing of agricultural produce. However, success is yet to be achieved as observed, especially for cooperatives which are financially weak. It is hoped that some kind of a bank could be established to provide capital to these associations when they have proved to be working competently.

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Appendix 1: GROSS MARGIN ANALYSIS FOR NDUNGU IRRIGATION PROJECT.

Area 0.3 ha. Output 30 bags of paddy.

PRODUCT	UNITS	PRICE (Tshs.)	TOTAL(Tshs.)
Paddy	30 bags	9000	270000
By-products	—	—	—
Total Value of Production			270000
Value of Production per ha.			900000
VARIABLE COSTS			
Seeds	—	—	—
Fertilizer-Urea	70 kg.	200	14000
Insecticide-Thiodan	4 appl.	1500	6000
Herbicides	1	5800	5800
Weeding (by Hand)	1	3000	3000
Plot Clearing	1	6000	6000
Tertiary Canal Cleaning	1	2000	2000
Seedling Preparation	1	1500	1500
Puddling + Water Charge	1	20500	20500
Seedling Transportation	1	4500	4500
Transplanting	1	12000	12000
Harvesting (Cutting)	1	10000	10000
Threshing	30	800	24000
Gunny bags	30	700	21000
Transportation	30	3000	9000
Bird Scaring	1	10000	10000
Cleaning Drainage System	1	5000	5000
TOTAL VARIABLE COSTS			154300
Total Variable Costs/ha.			514000

Total Value of Production 0.3 ha.	Tshs. 270,000
Total Variable Costs 03. ha.	Tshs. 154,300
Gross Margin per Plot 0.3 ha.	Tshs. 115,700
Total Value of Production 1.0 ha.	Tshs. 900,000
Total Variable Costs 1.0 ha	Tshs. 514,000
Gross Margin per ha	Tshs. 386,000

Gross Margin as % to Variable Costs per ha. 75 %

Note: * Data above are based on the average farmer with 0.3 ha. and harvest of 30 bags during the wet season. A farmer who owns 4 plots will have a gross margin of Tshs. 115,700 × 4 = Tshs. 462,800. He will also have an extra income if he has a plot for the dry season.

* Farmers can save on such variable costs as weeding, tertiary canal clearing, seedling preparation and transportation, transplanting, harvesting threshing and bird searing, by totally or partially replacing outsource labour with family labour, and increase income.

Appendix 2: GROSS MARGIN ANALYSIS FOR FARMERS IN NDUNGU (Outside the Project.)

Area 0.3 ha. Output 12 bags of paddy.

PRODUCT	UNITS	PRICE (Tshs.)	TOTAL (Tshs.)
Paddy (Local Variety)	12 bags	10000	120000
By-products	—	—	
Total Value of Production			120000
Value of Production per ha.			400000
VARIABLE COSTS			
Seeds	—	—	—
Fertilizer	20 kg.	240	4800
Paddling	0	5000	5000
Chemicals	2 appl.	1000	2000
Harvesting	1	8000	8000
Bird Scaring	1	10000	10000
TOTAL VARIABLE COSTS			29800
Total Variable Costs/ha.			99000

Gross Margin 0.3 ha. Tshs. 90,200
Gross Margin 1.0 ha. Tshs. 301,000

Note: * Local seed varieties are used. The crop is for home consumption. Only surplus is Lmarketed (about half of the output).
* Productivity is lower outside the project with average of 12 bags per 0.3 ha.
* Better prices for the local varieties are obtained since they are more tasty
* Valuable costs of family labour is not included, nor is the cost of gunny bags as all the harvested crops are assumed to be for home consumption or for the nearby market.